CHAPTER 2
AIR INTAKE

2-1. Location.
The intake for a compressor will be located either outdoors or indoors, whichever provides better air quality. Elevation of the compressor relative to sea level is required to determine atmospheric pressure and density of intake air. Air quality will be judged by its temperature, humidity, and cleanliness. Indoor sound levels are lower when the air intake is located outside the building, especially with a reciprocating compressor. Where practicable, an outside air intake should be located on the coolest side of the building. at least 6 feet above the ground or roof. For reciprocating units, the intake will be located at least 3 feet away from any wall to minimize the pulsating effect on the structure, and an intake filter silencer or an intake pulsation damper should be provided. A compressor intake must not be located in an enclosed courtyard. Intake pipes must be positioned to prevent entrance of snow or rain water, and must be far enough from steam, gas, or oil engine exhaust pipes to insure intake air that is free of moisture or pollution. Protection by a hood or louvers should be considered when the intake is subject to adverse weather conditions. It is desired that the intake air filter be located on the compressor and piped from the enclosed filter hood to the outside. This method prevents ingestion of foreign material to the internals of the compressor should the piping have a poor joint or other leak upstream of the intake filter.

2-2. Intake temperature.
The density of air varies inversely with its temperature; an increase in delivery of approximately I percent is gained for every 5 degrees F reduction of intake temperature. Table 2-I shows the effect of inlet or initial temperature on air compressor delivery and demonstrates the importance of locating the air intake at the coolest air source, usually the north side of the building.

2-3. Intake pipe materials.
The inside of intake piping must be smooth and not subject to rusting or oxidation. Rust that flakes off will enter and damage the compressor. Acceptable intake air piping materials include plastic, copper, stainless steel, aluminum, or galvanized steel. On metallic piping, mechanical couplings will be used. Welded joints must be avoided since weld beads can break free, enter, and damage the compressor.

2-4. Critical pipe lengths.
Resonance of intake piping with reciprocating air compressors is prevented by avoiding certain pipe lengths. These are called "critical pipe lengths," and are a function of the air temperature and the speed of the compressor in revolutions per minute (rpm). Critical pipe lengths must be verified with equipment manufacturers.

2-5. Intake air filter.
The selection of the filter type is based on whether the air compressor to be used is lubricated or nonlubricated, and on the quality of ambient air.

a. Viscous impingement filters have an efficiency of 85 to 90 percent of particle sizes larger than 10 microns. This type of filter is acceptable for lubricated reciprocating compressors operating under normal conditions.

b. Oil bath filters have an efficiency of 96 to 98 percent of particles sized larger than 10 microns. This type of filter is more expensive, and for the most part no longer recommended by compressor manufacturers, but may be considered for lubricated reciprocating compressors operating

Table 2-1. Effect of intake temperature on air compressor delivery.

Initial Temperatures			Initial Temperatures		
Deg F	Deg F abs	Relative Delivery	Deg F	Deg F abs	Relative Delivery
-20	440	1.180	70	530	0.980
-10	450	1.155	80	540	0.961
0	460	1.130	90	550	0.944
10	470	1.104	100	560	0.928
20	480	1.083	110	570	0.912
30	490	1.061	120	580	0.896
32	492	1.058	130	590	0.880
40	500	1.040	140	600	0.866
50	510	1.020	150	610	0.852
60	520	1.000	160	620	0.838

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under heavy dust conditions.

c. Dry filters have an efficiency of 99 percent of particles larger than 10 microns. Because of their high filtration efficiency, these filters are the best selection for rotary and reciprocating compressors. They must be used for nonlubricated compressors and whenever air must be kept oil-free.

d. Two-stage dry filters, to provide 99 percent efficiency of particles larger than 0.3 micron. will be used for centrifugal units

e. With all types of filters, a means of monitoring the air pressure drop through the element must be provided. which indicates element contamination.

2-6. Dust and vapors.

All air compressors are sensitive to dust and airborne vapors which can form adhesive, abrasive, and corrosive mixtures within the compressor. These contaminants build up in rotating parts and can induce excessive wear and mechanical unbalance, thereby damaging the compressor.